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ABSTRACT

A study was undertaken at Williams Air Force Base, Arizona to ascertain the impact, usefulness, and acceptance by students of learning centers within Undergraduate Pilot Training (UPT). The first step in the project was the construction and administration of an attitude scale designed to measure UPT students' attitudes toward learning centers. Statements made by students formed the basis of a 104 item scale, which was refined to 16 items following review by instructors and tryout on a sample group. Responses of 197 UPT students to the final 16-item scale indicated that better than 96% of the group had strong positive attitudes toward the learning center. Comments made by individuals taking the test showed that not only are such centers accepted by the students, but also that students are capable of providing learning center managers with information useful in the design and operation of such centers. (PB)

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AIR FORCE HUMAN RESOURCES LABORATORY

LEARNING CENTER EVALUATION

MEASUREMENT OF STUDENTS' ATTITUDES TOWARD UNDERGRADUATE PILOT TRAINING LEARNING CENTERS

By

Lester H. Baer, Captain, USAF

FLYING TRAINING DIVISION
Williams Air Force Base, Arizona 85224

March 1973

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AIR FORCE HUMAN RESOURCES LABORATORY
AIR FORCE SYSTEMS COMMAND
Williams Air Force Base, Arizona 85224

FOREWORD

This study is Volume I of a two-part study performed in-house in response to an Air Training Command request for Air Force Human Resources Laboratory assistance in the Williams Air Force Base learning center.

This study was conducted under Project 1123, USAF Flying Training Development; Task 112302, Instructional Innovations in Flying Training.

Special thanks go to Lieutenants Bruce L. Tipton and Thomas K. Toula for interviewing and data tabulations, and Ms. Marjorie Scotten for chart and table preparation.

This report has been reviewed and is approved.

Harold E. Fischer, Colonel, USAF
Commander

ABSTRACT

This project was an initial study to ascertain the impact, effectiveness, and acceptance of learning centers within Undergraduate Pilot Training (UPT). Using an in-house developed scale, characterized by equal-appearing intervals as first proposed by Thurstone and Chave, measurement of student toward UPT learning centers was made. Administration of the scale to 297 UPT students produced very strong evidence of positive, favorable attitude toward the learning center concept. Comments, obtained during student interviews and final form administration, may be beneficial to learning center managers and operators.

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LEARNING CENTER EVALUATION

MEASUREMENT OF STUDENTS' ATTITUDES TOWARD UNDERGRADUATE PILOT TRAINING LEARNING CENTERS

I. INTRODUCTION

In March 1971, Air Training Command (ATC) opened an experimental learning center for Undergraduate Pilot Training (UPT) students at Williams Air Force Base (AFB), Arizona. The philosophy behind the learning center and its equipment and capabilities have been described elsewhere (Wood, 1970a, 1970b, 1971). Following establishment of the learning center, a need was expressed by Air Training Command for evaluation of this concept in the UPT program.

Since the learning center was still in its formative stages, as far as the production of various instructional packages was concerned, the effects of the instructional materials on student pilot performance were not investigated in this study. However, an attitude survey appeared to be an effective way of determining student reaction and acceptance of this innovation in flying training; the present study was initiated to assess student pilot attitude toward the learning center at Williams Air Force Base. Selection of a Thurstone equal-appearing interval attitude measurement technique for the present study was based upon several considerations. In 1934 Remmers and Silance concluded that with reference to all other rating scales in use at that time, Thurstone's technique was "...theoretically and logically the best procedure yet devised for obtaining valid and reliable measures of psychological variables..." Attitude of course is one of those psychological variables. Later Ferguson (1939) concluded, "...attitude scales constructed by the method of equal-appearing intervals satisfy more of the requirements (of an adequate attitude scale) than do those constructed by any other methods..." including Likert's method and other scaling techniques previously developed.

This study employs an in-house-developed attitude scale using the technique of equal-appearing intervals first proposed by Thurstone and Chave (1929) and later refined and simplified (Ballin & Farnsworth, 1941; Edwards & Kilpatrick, 1948; Farnsworth, 1945a, 1945b; Ferguson 1939; Franklin & McLemore, 1967; Green, 1954; Nystrom, 1933; Seashore & Hevner, 1933; Webb, 1951). Attitude measurement is a little used technique in evaluation of students or Air Force training programs. However, it is a very effective way of providing systems evaluators with information, prior, during, or after systems implementation to determine acceptance and attitude toward revisions or innovations in training. This study is of potential interest to instructional materials and device designers, test designers, and course monitors, and details two specific facets of attitude measurement pursued during this study: (*a*) How the equal-appearing interval attitude measurement scale was designed, and (*b*) the results obtained when the scale was administered to UPT students in training.

II. METHOD OF SCALE CONSTRUCTION

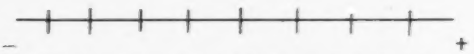
Interviews

Extensive interviews were conducted with small groups of UPT students in the T-37 and T-38 aircraft. The objective of these interviews was to generate an item pool for use in construction of the attitude scale. The groups were asked, "What is it you like or dislike about the UPT learning centers, and why?" Several hundred ideas were presented and recorded using this technique. The interviews were terminated only after the independent groups began to repeat the ideas and statements of previous groups. The results of these interviews were listed and arranged as short single-thought sentences. Any sentence that dealt with specific programs (software) was discarded and only generalizable statements of attitude toward the concept 'learning center' were retained. This process resulted in a pool of 104 items ranging from extremely favorable through neutral to extremely unfavorable.

Judging

A randomly selected instructor pilot from each T-37 and T-38 flight formed a panel of 14 judges. They were presented with the randomized set of 104 items shown in Appendix I. A typical statement with it's rating line is shown in Figure 1. The judges were verbally instructed, "Assume a UPT student made each of these statements. Place a mark on the rating line which indicates your judgment of the student's attitude toward the UPT learning center. The minus (−) indicates the most negative attitude on the part of the student, the plus (+) indicates a student with the most positive

attitude. The center of the line indicating a neutral attitude. Remember, we do not want your attitude toward the learning centers, you are to judge the attitude of a student who would make each statement."



The learning center is extremely helpful.

Fig. 1. **Typical rating line used by judges on 104 attitude statements.**

Several judges required restatement of the instructions and further clarification of the task. When it was apparent that each judge was sure of his part in the process, they were allowed to begin. No judge took more than 40 minutes to complete the task. The intervals on the scale were numbered from 1 to 9 with 1 being the extreme left side of the rating line and 9 being the extreme right side. The results of the judging and scoring are summarized in Table 1. The median scale values assigned by the judges for each statement were computed. The inter-quartile range (Q) which is a measure of the degree of disagreement among the judges was calculated and interpreted in this case as the ambiguity (Edwards & Kilpatrick, 1948) of each statement.

Tryout Form of Scale

On the basis of the judging, the 104 item pool was reduced to a 31 item tryout scale form. The reduction of items from 104 to 31 was accomplish by first picking the two items within each scale interval that had the lowest Q values, resulting in a set of 16 items. This was done to insure measurement over the 8-point interval continuum (no statement had a high enough median scale value to be included in the original 9th interval). A plot of scale value of these 16 items versus Q-value was made and showed certain gaps in the measurement continuum. An additional 15 items of the lowest possible Q-value were selected to fill these gaps (Figure 2). This resulted in the 31 item tryout form. Thurstone's original work allowed Q values up to 3. Nystrom (1933) allowed no Q larger than 2. All 31 items used in this study fell within these guideline values. The largest Q was 1.813 in the tryout form and 1.375 in the final form. See Appendix II for the tryout form.

The tryout form was administered to 3 randomly selected students, from each flight in UPT, during February 1972 for a total N = 42. The students were asked to indicate whether they agreed or disagreed with the statements. Since each statement had a scale value (unknown to the students), it was possible to score their attitude as the scale value of the median item with which they agreed (Webb, 1951). Responses to this tryout are shown in Table 2.

It was originally intended to use Thurstone's index of similarity to reject inconsistent items from the tryout form, but this proved to be unfeasible because the students' attitudes toward the learning center were so overwhelmingly positive that almost all agreed with the positive statement, and nearly none agreed with the negative statements. So another criterion of inconsistency was devised for this study. Each item that a student agreed with, that had a scale value which differed from the student's overall score by more than 2, was given one inconsistency point (I). The results of this analysis are shown in Table 3. Based on this criterion, the two items with the highest I scores were eliminated from the original set, and two of the 15 additional items with low I scores were selected to replace them. Two additional items were used as replacements based on this analysis of inconsistency and because further anlaysis of Q-values necessitated changes in the number of items within intervals. Thus, a final 16-item scale was derived that represented the attitude continuum to be measured, whose median Q value was 1.175. Q-value information throughout the scale development is summarized in Table 4, and a plot of the final 16 items versus their Q values is shown in Figure 3.

Final Form

The final 16-item attitude scale was administered to 297 UPT students at Williams Air Force Base, by their class commanders. This represented 11 of the 14 sections in training during April and May 1972 in the T-37 and T-38 aircraft. Due to errors in completing the form, only 288 returns were scoreable. The instructions and final form are in Appendix III. A Likert-style request, for the student's overall attitude toward the learning center, was included in the final questionnaire form; intended as a reliability check on the Thurstonian scale, or as a discriminant if the results of the Thurstone scale were inconclusive. However, the results of the experiment were so clear-cut that this overall scale was not used in this experiment. The comment section on the front page of the form was used by 81 students and the findings are covered in the discussion section, page 8.

Table 1. **Scale Values, Median (Q_2) Scale Values and Inter-Quartile Range (Q) of 104 Items Rated by 14 Judges**

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Q_2	Q
1	8	8	8	6	8	8	7	8	8	9	9	7	8	8	7.944	.778
2	4	8	6	7	8	8	8	7	8	7	9	7	4	7	7.300	1.400
3	5	8	7	6	8	8	7	7	6	6	7	5	8	8	7.000	1.800
4	3	9	6	8	9	8	6	7	6	7	8	6	8	8	7.500	2.075
5	7	9	6	6	9	7		6	6	6	6	8	6	6	6.312	1.469
6	7	8	5	8	9	8	7	7	7	7	8	7	7	7	7.350	1.693
7	7	9	4	8	6	3	8	6	7	3	5	5	4	6	5.833	3.000
8	6	8	4	7	6	5	6	7	7	4	5	6	4	6	5.900	1.916
9	8	9	6	7	8	5	7	5	6	4	6	6	5	6	6.100	1.917
10	6	8	7	7	6	6	6	6	8	6	6	6	5	6	6.166	.973
11	3	2	2	2	2	1	1	2	4	1	1	5	1	2	1.833	1.216
12	5	4	4	3	4	3	2	4	4	2	3	5	2	3	3.500	1.935
13	3	9	8	7	6	2	5	7	7	6	6	6	6	8	6.300	1.333
14	3	9	7	7	9	5	6	5	7	7	6	6	7	6	6.500	1.575
15	5	9	7	7	7	5	7	6	6	6	5	6	6	8	6.300	1.525
16	2	8	8	5	5	6	8	6	5	8	6	6	6	8	6.100	2.292
17	9	8	7	7	9	7	8	9	7	9	7	7	8	9	7.750	1.750
18	5	8	8	7	6	6	7	6	6	7	6	7	6	6	6.357	1.268
19	4	7	6	5	6	4	7	7	7	6	6	3	5	6	6.000	1.850
20	7	7	7	4	5	3	7	7	6	7	5	4	3	7	6.500	2.750
21	3	4	4	3		5	3	4	4	3	4	4	3	3	3.600	1.084
22	2	7	7	6	3	4	8	6	5	6	5	5	8	6	5.750	2.084
23	2	2	2	2	3	2	3	5	4	4	2	5	2	2	2.375	1.813
24	4	4	3	4	3	4	6	4	4	4	5	5	2	3	3.928	1.095
25	3	2	1	5	2	3	3	4	4	3	3	5	4	6	3.300	1.733
26	5	5	2	4	3	2	6	5		4	4	4	5	5	4.375	1.488
27	6	7	6	6	5	5	5	6	4	6	6	4	4	5	5.500	1.458
28	4	8	8	5	4	3	6	6	5	6	7	5	5	5	5.300	1.733
29	3	8	6	5	5	5	7	6	5	6	6	5	5	4	5.500	1.375
30	4	8	7	6	8	5	7	7	5	6	6	4	5	7	6.166	2.125
31	3	2	3	4	5	2	4	3	4	3	2	7	2	3	3.100	1.625
32	4	7	7	6	5	6	8	6	6	7	7	7	6	6	6.333	1.250
33	5	3	4	4	4	3	8	4	4	4	3	7	4	4	4.000	.875
34	5	3	4	4	4	3	8	4	4	4	3	5	4	3	3.928	1.053
35	7	4	3	4	3	3	8	3	4	3	3	6	4	3	3.500	1.375
36	6	4	3	4	3	3	8	3	4	3	3	6	4	3	3.500	1.375
37	8	8	7	6	6	5	8	6	5	6	6	7	5	7	6.300	1.733
38	3	6	6	4	5	3	4	4	4	3	4	6	3	4	4.000	1.625
39	3	3	4	2	4	3	7	4	3	3	3	6	3	5	3.900	1.625
40	3	7	7	6	5	6	8	7	6	7	6	6	6	5	6.166	1.292
41	5	4	3	3	4	4	7	4	4	3	6	6	3	4	4.000	1.625
42	2	6	9	8	6	5	3	4	4	3	7	8	8	8	6.000	4.035
43	4	6	6	6	5	5	5	5	6	3	6	8	4	5	5.166	2.250
44	5	8	8	7	6	6	6	7	7	7	7	6	6	6	6.500	1.284
45	6	5	4	3	4	6	7	4	4	4	6	8	4	4	4.357	2.143
46	3	2	3	3	4	3	6	4	4	4	4	3	4	3	3.500	1.167
47	5	5	3	2	4	3	6	4	4	4	4	3	5	6	4.100	1.667
48	5	7	4	5	5	3	5	5	4	4	5	3	4	6	4.666	1.375
49	5	7	7	6	5	4	6	6	5	4	4	4	4	7	5.166	2.133
50	7	8	7	7	6	5	8	7	6	7	8	8	7	6	7.000	1.292
51	2	2	1	1	3	2	1	3	3	1	2	3	1	2	1.750	1.065
52	5	9	8	6	5	3	7	7	7	7	6	7	6	7	6.666	1.584

Table 1 *(Continued)*

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Q_2	Q
53	4	8	8	8	7	3	7	7	7	9	8	8	8	8	7.642	1.267
54	5	8	4	8	6	2	4	6	6	6	5	4	5	6	5.500	1.867
55	6	8	4	6	7	3	6	7	7	6	5	5	5	6	5.900	1.666
56	5	8	8	7	7	7	7	7	7	8	8	7	6	6	7.071	1.054
57	4	5	4	4	5	4	6	4	4	4	5	7	4	4	4.377	1.112
58	6	7	7	7	6	5	6	6	4	6	4	5	4	7	5.900	1.959
59	4	4	3	4	5	3	5	3	5	3	4	5	4	4	4.000	1.250
60	6	4	3	4	5	2	6	7	6	4	7	5	4	5	4.833	2.375
61	3	5	2	5	4	2	2	3	5	1	3	6	1	4	3.166	3.000
62	5	6	7	7	7	6	7	7	7	8	7	6	8	7	6.875	.979
63	5	5	4	2	4	3	3	4	5	6	3	3	2	5	3.833	2.000
64	4	6	5	4	5	5	7	7	7	4	7	6	4	7	5.500	2.425
65	5	9	9	9	8	8	8	8	7	9	8	8	9	9	8.333	1.166
66	4	6	4	5	7	3	3	5	5	3	5	7	3	3	4.500	2.175
67	6	7	8	4	8	5	7	7	7	8	8	7	6	7	7.000	1.375
68	6	7	7	5	6	5	7	7	7	6	7	5	7	7	6.625	1.396
69	6	8	8	6	6	5	7	7	7	7	6	6	7	6	6.500	1.284
70	6	8	8	5	6	6	7	7	7	8	6	7	8	7	6.900	1.500
71	4	2	1	3	4	2	4	3	5	1	3	6	1	3	3.000	2.230
72	5	6	9	5	7	6	7	8	7	9	7	8	9	9	7.250	2.500
73	5	3	2	2	4	3	3	3	5	1	2	5	1	3	2.900	2.334
74	5	9	9	8	8	7	8	8	6	9	7	6	9	8	7.900	1.850
75	5	6	4	4	4	5	8	6	7	4	6	6	3	7	5.500	2.250
76	5	7	8	7	6	7	8	7	1	8	6	7	8	7	6.750	1.054
77	5	8	8	7	7	7	9	7	7	8	7	7	8	7	7.250	1.063
78	5	8	7	7	7	6	8	7	6	8	7	6	8	7	7.000	1.292
79	6	9	9	7	7	7	8	8	8	9	7	7	9	8	7.750	1.625
80	6	8	7	6	6	5	7	7	5	7	6	5	3	6	6.100	1.542
81	5	4	4	4	5	3	2	6	5	6	4	3	4	6	4.300	1.733
82	5	7	7	6	5	5	8	6	7	6	7	6	8	6	6.300	1.525
83	5	7	8	6	5	6	7	7	6	8	6	6	8	6	6.333	1.583
84	7	8	8	7	6	6	7	6	5	8	7	7	8	6	6.900	1.500
85	4	7	7	8	5	8	8	5	7	6	7	8	9	5	7.000	2.542
86	6	9	7	8	7	8	8	7	7	8	7	7	8	6	7.333	1.250
87	6	7	8	8	7	7	7	7	7	8	6	6	8	4	7.000	1.292
88	7	7	6	8	8	5	3	7	7	7	5	5	8	5	6.700	2.275
89	7	8	8	9	6	7	7	7	7	8	8	6	6	8	7.300	1.340
90	4	2	4	3	3	3	7	4	5	2	4	6	3	3	3.500	1.575
91	5	6	8	7	7	5	7	7	7	9	8	6	8	8	7.100	1.625
92	5	7	8	6	7	5	7	7	7	6	7	6	8	6	6.666	.875
93	5	2	3	3	4	2	2	3	4	3	3	3	2	5	3.000	1.375
94	6	8	7	7	7	4	7	7	7	8	7	7	8	6	7.000	.875
95	6	8	8	6	7	7	7	7	6	7	7	6	8	7	6.928	1.053
96	6	2	2	3	3	4	3	3	4	1	4	4	2	2	3.000	1.750
97	5	8	8	7	9	6	7	7	6	8	8	7	8	6	7.250	1.667
98	5	9	8	7	6	7	8	6	6	9	8	7	8	7	7.330	1.375
99	4	4	4	4	5	5	8	4	4	2	5	6	2	3	4.166	1.417
100	6	8	7	7	7	5	8	7	7	7	8	6	8	6	7.000	1.292
101	5	4	2	2	4	2	2	4	4	3	3	4	2	4	3.500	1.883
102	2	1	1	1	3	2	1	3	5	1	1	2	2	1	1.500	1.375
103	5	6	6	7	6	5	8	4	7	6	7	7	8	4	6.250	1.875
104	2	1	1	1	3	2	2	3	4	1	1	2	2	2	1.833	1.216

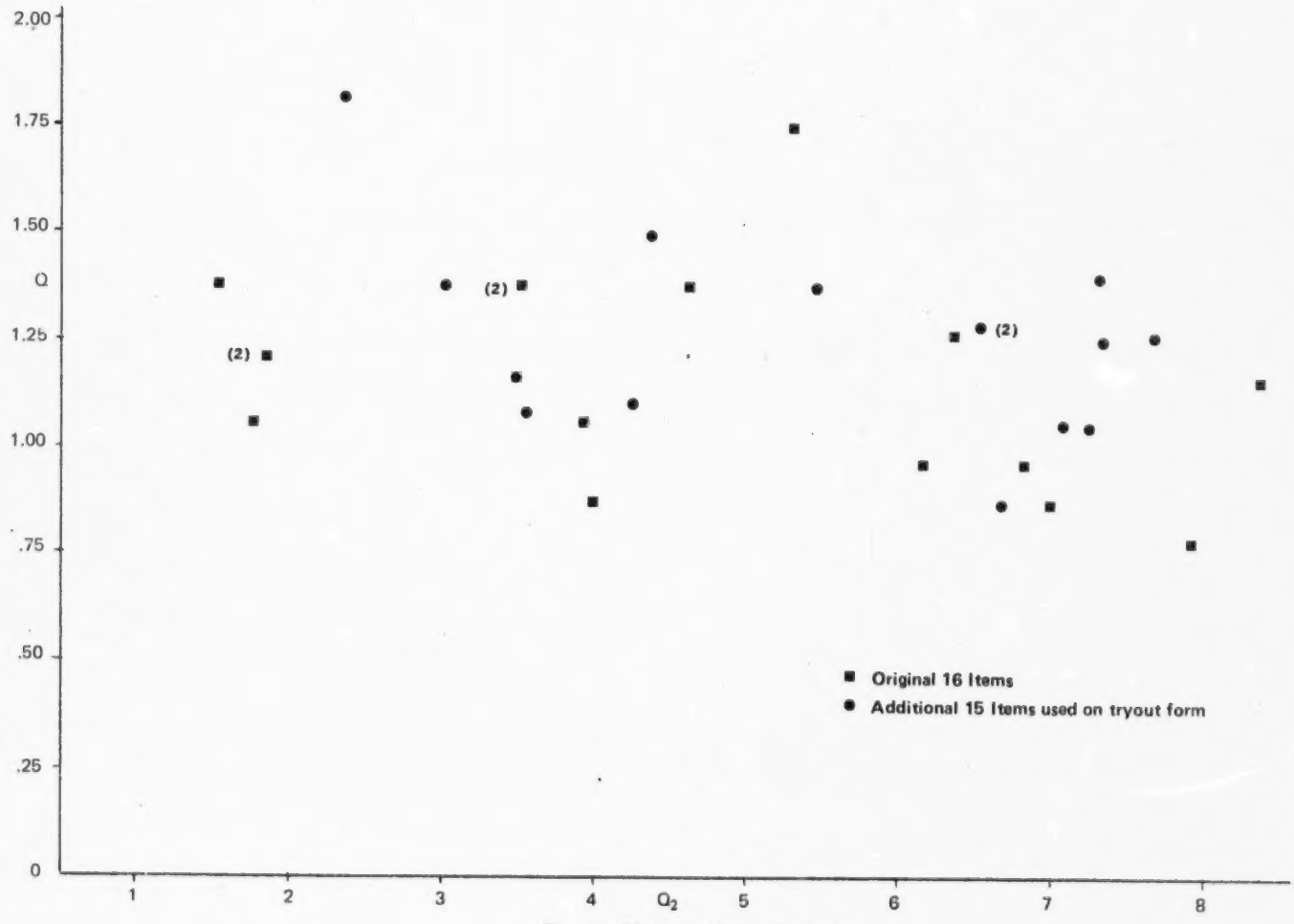


Fig. 2. 31 tryout items Q_2 vs. Q.

Table 2. **Statements Agreed to by 42 Students on Tryout Form of Attitude Scale**

Item	Q_2	Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1	7.944	.778	A		A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A		A	A		A	A	A	A	A	A	A		A	A	A			A	A	A	A	A
2	6.166	.973	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A		A	A	A	A	A	A	A
3	1.833	1.216											A																															
4	5.30	1.733			A	A								A	A	A								A						A	A	A						A	A	A			A
5	6.333	1.250	A	A	A	A	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			A
6	4.00	.875		A	A	A	A	A	A		A	A		A			A	A		A	A	A	A			A							A	A	A							A
7	3.928	1.053					A						A				A		A																								A
8	3.50	1.375																				A							A					A									
9	3.50	1.375		A	A	A	A		A			A					A	A		A		A	A			A			A														A
10	4.666	1.375	A	A		A		A	A	A	A	A	A	A	A			A	A	A		A		A	A	A	A		A		A		A		A	A		A	A	A	A	A	A
11	1.75	1.065												A																														
12	8.333	1.166	A		A	A	A		A			A			A	A	A	A	A									A			A		A		A	A	A			A	A		A	
13	7.00	.875	A		A		A		A	A				A		A	A			A	A	A				A	A	A	A	A		A			A		A	A		A	A	A		A
14	1.50	1.375											A																															
15	1.833	1.216																																										
16	6.875	.979	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	3.50	1.167	A	A	A	A	A		A	A	A	A		A				A			A	A		A	A		A	A	A	A	A		A	A	A	A		A	A	A	A		A	A
2	6.666	.875	A	A	A	A	A		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A
3	3.00	1.375	A		A	A	A		A	A	A	A	A		A		A		A	A	A		A		A	A	A	A	A	A	A	A	A		A		A	A	A	A	A		
4	7.30	1.400	A	A	A	A		A	A	A		A		A	A	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
5	3.583	1.084				A					A	A					A			A			A						A				A		A							
6	2.375	1.813				A					A			A								A			A		A	A			A												
7	4.375	1.488	A	A	A		A	A		A	A	A	A	A							A		A	A			A		A	A	A				A	A		A		A			A	
8	5.50	1.375	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
9	6.50	1.284	A	A	A		A	A	A	A		A		A		A	A	A		A	A			A		A	A	A	A	A	A			A			A	A	A	A	A		A
10	7.642	1.267	A	A	A		A	A	A	A	A			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A
11	7.071	1.054	A	A	A		A		A	A	A				A	A	A	A		A		A	A	A	A	A	A	A	A	A	A		A		A		A	A	A	A		A	A	A	A	A
12	4.277	1.112	A	A			A	A	A		A	A		A				A					A			A	A			A		A		A	A									
13	6.50	1.284	A		A	A	A	A	A	A	A	A		A	A	A	A	A	A	A		A	A	A	A	A		A	A	A		A	A		A	A	A	A	A	A	A	A	A	A
14	7.25	1.063	A	A	A	A	A	A	A			A		A	A	A	A	A	A	A	A	A	A	A		A					A		A	A	A	A	A	A	A	A	A	A	A	A
15	7.333	1.250	A	A	A	A	A		A	A		A	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Note. - A = Student agreed with statement.

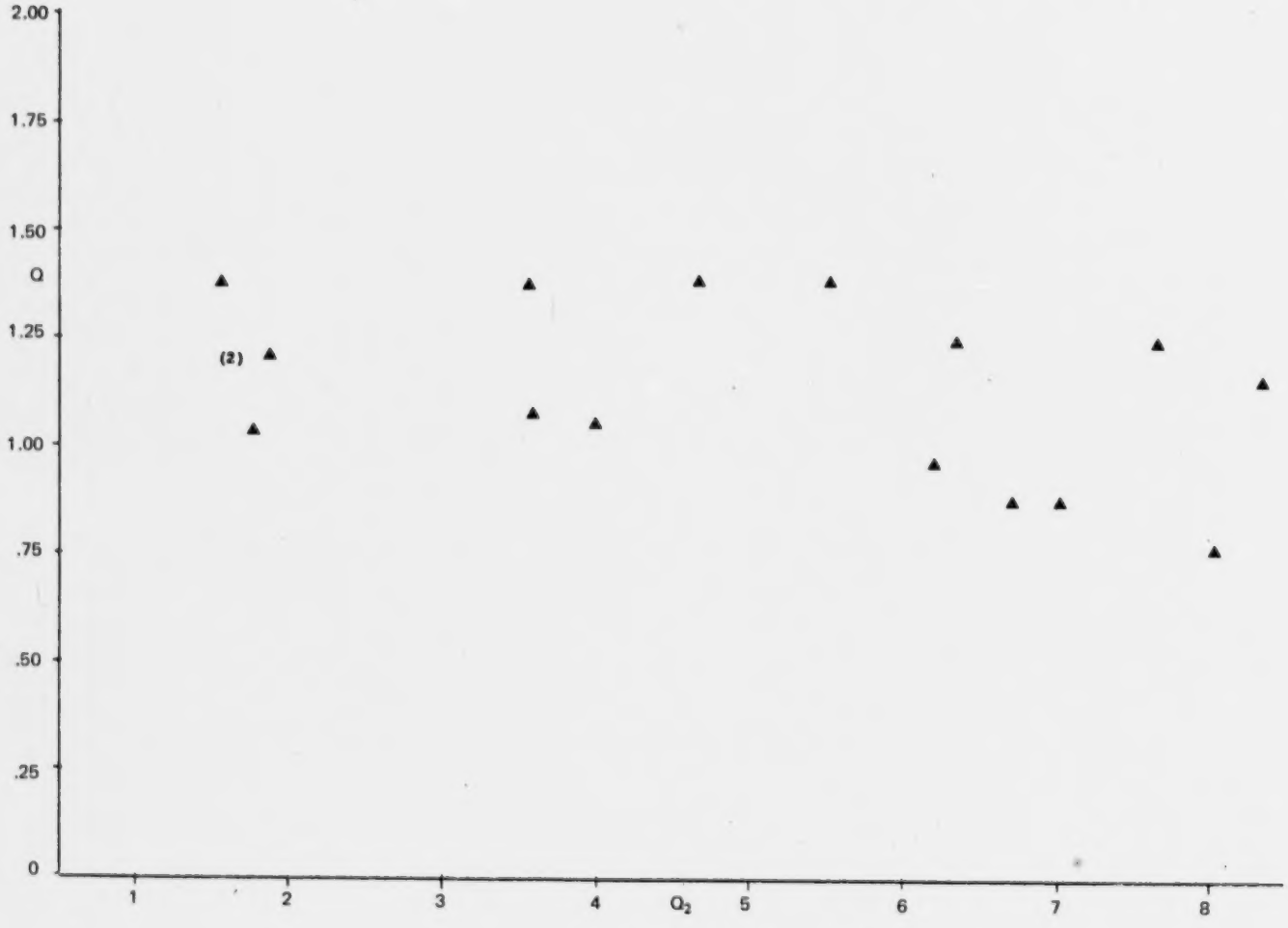


Fig. 3. **16 final items Q_2 vs. Q.**

Table 3. **Results of Inconsistency Analysis on 31 Item Tryout Form of Attitude Scale**

Statements	Number of Students Agreeing with Statement	I
1	35	1
2	39	0
3	1	0
4	13	0
5	39	0
6	20	9*
7	5	3
8	3	3
9	14	14*
10	30	0
11	1	1
12	20	0
13	24	0
14	1	1
15	0	0
16	41	1
1	30	29
2	39	1**
3	31	29
4	37	0
5	9	3**
6	8	8
7	22	9
8	40	0**
9	28	0
10	38	1**
11	32	0
12	16	7
13	36	0
14	31	0
15	39	1

*Deleted for inconsistency.
**Added.

Table 4. **Changes in Range and Median Scale Values During Development of Final Attitude Scale**

Items	Range	Median
104-Item Pool	.778-4.035	1.550
Deleted 73 Items	1.053-4.035	1.688
31 Item Tryout Scale	.778-1.813	1.208
Deleted 15 Items	.875-1.813	1.275
16 Item Final Scale	.778-1.375	1.175

III. RESULTS

The results are shown in Figure 4 and Table 5. Visual inspection by the reader is sufficient to confirm the compelling evidence of positive attitude toward the learning centers. Over 96 percent of the students had a positive attitude toward the learning centers. Fewer than 3 percent of the students had a negative attitude toward the learning center. Table 5 is a summary of Figure 4.

Table 5. **Frequency, Percentage and Cumulative Percentage of Final Scores on Attitude Scale (N = 288)**

Score	f	Percent	Cumulative Percent
Very Positive			
7-7.9	79	27.43	27.43
6-6.9	194	67.36	94.79
5-5.9	4	1.39	96.18
4-4.9	4	1.39	97.57
3-3.9	3	1.04	98.61
2-2.9	4	1.39	100.00
1-1.9	0	0.00	100.00
Very Negative			
Total	288	100.00	100.00

Further, it was observed that the judging of the prospective scale items by IP's added less than 40 minutes to the total process of constructing the scale. This supports Seashore and Hevner's (1933) contention that rating instead of Thurstone's original scoring procedure, which involved sorting the statements into 11 piles, is faster, easier and more convenient.

IV. DISCUSSION

Two sources of data, apart from the measurement of student's attitudes, appear to have some benefit to managers and operators of the learning centers. The first source is from the original student interviews and the second is from comments on the final form. A list of typical comments sifted from these sources is shown in Table 6. The general categories of favorable and unfavorable comments were: (*a*) subject matter and programming, (*b*) environment, (*c*) media, (*d*) use for orientation, (*e*) review/remedial use, and (*f*) general usage. Most of the shortcomings mentioned in the questionnaires have been

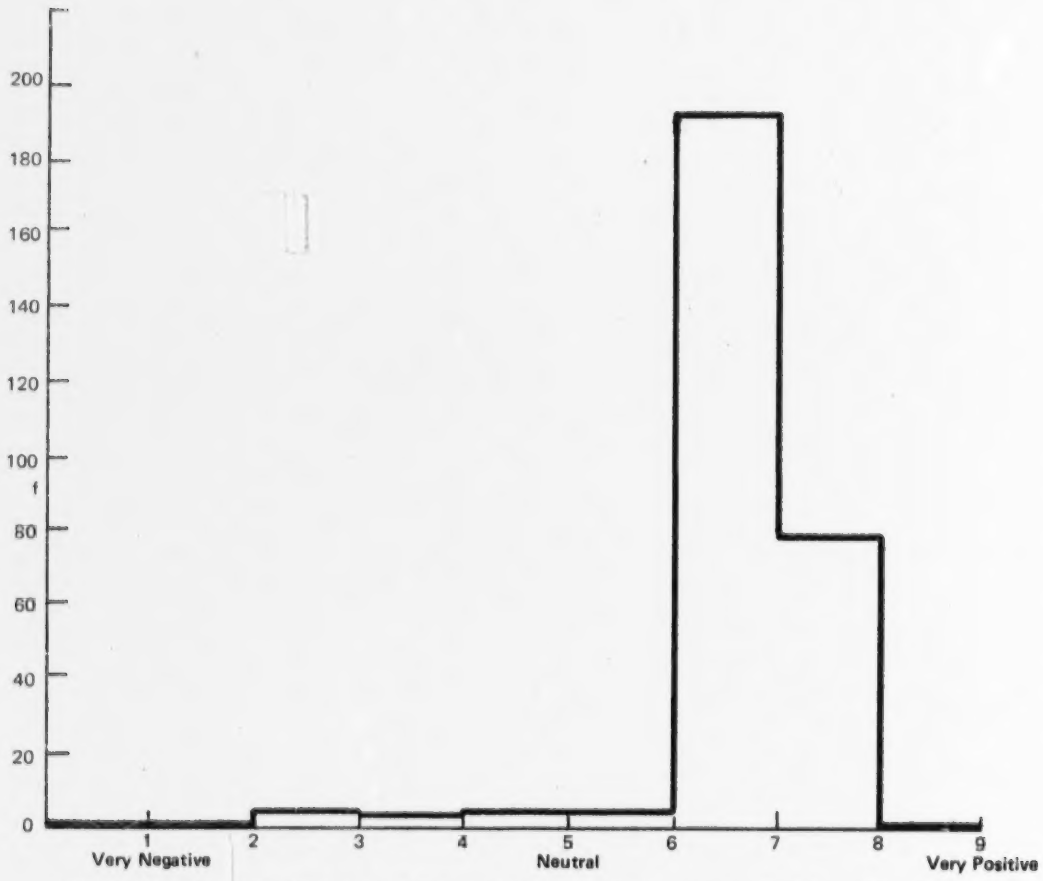


Fig. 4. Number of students in each interval based on attitude score on final form (N = 288).

Table 6. **Selected Student Comments from Initial Interviews and Final Form Comments Section**

Favorable Comments

1. **Subject Matter and Programming**
   - Two-ship and four-ship films are excellent
   - Basically a good idea for learning procedural knowledge.
   - Emergency procedures training is good.
   - Good on internal and external preflight.
   - Dash-1 study was good.
   - Spins and night flying programs good.
   - Very good material – well done and informative.

2. **Environment**
   - Good atmosphere and conducive to good learning habits.
   - Quiet atmosphere to study is the best feature.
   - Provides a place to study in a quiet atmosphere, as opposed to the flight room.
   - Gives the student a chance to study away from the instructor and other distractions.
   - Excellent place to study.

3. **Media**
   - The films are an outstanding training aid.
   - 8mm films are good.
   - The visual displays showed what an instructor could not explain.

4. **Use for Orientation**
   - Good for orientation.
   - Helpful for initial introduction of a maneuver.
   - Provides a reference source for new material.
   - Provides a good foundation for material we must learn.
   - Greatly improves the student's ability to perceive a new maneuver prior to getting into the aircraft.
   - Learning center is very helpful during the first half of the program.
   - Helps, especially at first, with introducing aircraft and areas.

5. **Review/Remedial Use**
   - It serves as a good refresher for many phases.
   - An excellent review medium.
   - Extremely good for reviewing just prior to flight.
   - Excellent refresher for veteran pilots.
   - It is good for the extra help needed by students.
   - Learning center materials serve as a good supplement to outside study.

6. **General Usage**
   - Learning center provides material useful in all stages of T-37 program.
   - Not the greatest thing; but could not do without it.
   - No student felt that the center was a waste of time, money or value.
   - If learning center was used, you could really learn in detail what was required of you.
   - Seeing maneuvers in motion is very worthwhile.

Unfavorable Comments

1. **Subject Matter and Programming**
   - Must keep up with the changes in the material as they occur.
   - Use students to recommend changes.
   - Monotone voice on tape puts students to sleep.
   - Need questions that require a response and confirmation.
   - Programs go too slow when you're in a hurry.
   - Should be some way everyone could work at his own speed.
   - Need some films of the local flying areas.
   - Need more "see and do" programs.
   - Emergency procedures need more visuals.
   - Need more 8mm films on different subjects.
   - Need acrobatics films showing techniques.
   - Super-8 films should be of Williams AFB.
   - Need programs on advanced instruments and GCA.
   - "Imagination" tapes are not good.
   - Need some situation tapes.
   - Need more materials and more advanced materials.
   - The tapes are good but sometimes boring - could try background music.
   - Would like to see home base in films.
   - Need more on four-ship and navigation.
   - Too much repetition in the programs.
   - Checkride films should be available.

2. **Environment**
   - Should be open on weekends.
   - All students should wear headsets to reduce noise from speakers.
   - Some of the students make quite a bit of noise.
   - Could use music tapes for studying.
   - Would like a soft drink machine, coffee machine and a latrine in the learning center.
   - The learning center is noisy and has no privacy.
   - At times the temperature is uncomfortable.
   - The ventilation is inadequate if people are smoking.
   - Need to add more hours of operation.
   - Needs a library area.
   - If you allow smoking, you should allow food.
   - A drinking fountain would be nice.

3. **Media**
   - Super-8 should have stop action available.
   - T-38 center is too small and needs more super-8 projectors.
   - More projectors are needed in the T-38 learning center.
   - Video tapes are generally poor.

4. **Remedial/General Use**
   - The center would be more valuable as an optional place to work on weak areas.
   - I'm too busy watching required material to have time to study weak areas.
   - Center is primarily a backup source after instructor, link trainers and books.

overcome during the evolution of the learning centers, and should not be taken as indicative of present problems. It is interesting to note the type of information that can be obtained using the questionnaire technique. The survey offers evidence that students have a positive, favorable attitude toward the UPT learning centers as they are used at Williams Air Force Base. This bears out the intuitive evidence of success that instructor pilots, students, Air Training Command staff members and other visitors have felt.

V. SUMMARY

1. The first step in an evaluation of the Undergraduate Pilot Training learning center at Williams Air Force Base was the development and administration of an in-house developed Thurstonian attitude scale.

2. Development of the scale involved: (*a*) student interviews, (*b*) instructor pilot judgment of statements, and (*c*) student tryout. A 16-item scale was constructed in this manner.

3. Administration of the scale, to 297 student pilots, produced very strong evidence of positive, favorable attitude toward the learning center concept.

4. Comments obtained during student interviews and final form administration may be beneficial to learning center managers and operators.

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APPENDIX I. LIST OF 104 STATEMENTS RATED BY JUDGES

1. The learning center is extremely helpful.
2. The learning center gives a good visual experience.
3. The learning center uses the correct approach.
4. You can visualize things before you start flying.
5. Procedures outlined in the learning center are helpful.
6. The center has a good learning atmosphere.
7. You don't have to sit in the hot sun to learn things.
8. The learning center materials point things out.
9. It gets you familiar with instruments.
10. It is good on ground operations.
11. The learning center is not useful.
12. You need a simulator instead of a mockup in the learning center.
13. The tapes on the dash-one helped on a quiz.
14. The programs give you an idea of what to expect.
15. The center helps simulate things.
16. The learning center is real good.
17. The learning center can't be overused.
18. The programs are good on basic procedures.
19. The programs teach at a slow enough speed.
20. Times should be scheduled so that center can be used to study for a test.
21. The material teaches too fast.
22. The learning center is useful.
23. There is no feel for what is being done.
24. Some sort of simulation is needed in the learning center.
25. I am too busy to go over to the learning center when I need it the most.
26. Times should be scheduled better for learning center use.
27. The learning center has a nice atmosphere.
28. The learning center is good - everything is good.
29. The early part of the material is good.
30. The materials teach slow enough to learn.
31. The explanations are bad in learning center programs.
32. The explanations are good in learning center programs.
33. There is not enough room in the learning center.
34. The learning center is not cool enough.
35. There is too much noise at the learning center.
36. The center is too crowded.
37. The learning center is most useful when beginning training.
38. The programs are good only before you've done what is on the tape.
39. The learning center needs a water fountain.
40. The learning center has a good atmosphere.
41. The center does not point out specific needs.
42. You are lost if you don't use the learning center in the beginning.
43. You have to be alert to study in the learning center.
44. The center points out specific needs.
45. More visual material is needed in the learning center.
46. Monotone voice on tape puts you to sleep.
47. The center is not used after the first six weeks in the T-37.
48. Cokes should be allowed in the center.
49. The learning center is good in the beginning.
50. The programs help you to study procedures.
51. The center is not worthwhile.
52. The learning center material helps you to study for stan/eval tests.
53. The learning center makes for good use of time.
54. There is less physical work needed in the learning center.
55. You can sit and listen rather than read in the learning center.

56. The learning center has good supplemental material.
57. The center could be arranged better.
58. The learning center is good for the early part of training.
59. You get bored in the learning center sometimes.
60. A larger learning center is needed.
61. The programs do not help you study procedures.
62. The learning center is worthwhile.
63. The center was used for a week.
64. The learning center needs expansion.
65. The learning center is excellent.
66. Most of the learning center material can be gotten out of the book.
67. The center should be open on weekends.
68. The learning center has a good atmosphere.
69. The learning center is good for instruments.
70. The learning center is good concept.
71. The learning center is a bad place to study.
72. I can't think of any better idea than the learning center.
73. The learning center is a bad concept.
74. The learning center is an excellent idea.
75. The learning center could be larger.
76. The learning center is a good concept.
77. I use the learning center quite often.
78. The learning center is a good place to study.
79. The learning center is an excellent concept.
80. The learning center is good for the early part of training.
81. The learning center takes the place of reading the books.
82. The learning center is a good place to study.
83. The learning center idea is a good one.
84. The learning center is better than a link trainer for general information.
85. The learning center does not take the place of reading the books.
86. The learning center aids in understanding.
87. The concept of a learning center is good.
88. The learning center makes it less of a chore to study.
89. The learning center is the best source of primary information.
90. The learning center is too noisy.
91. I can't think of a better way to study than the learning center.
92. There is a good atmosphere in the learning center.
93. You can go to sleep in the learning center.
94. The learning center points out my weak areas.
95. The learning center has a good atmosphere for studying.
96. The learning center makes it more of a chore to study.
97. I use the learning center very often.
98. The learning center is worth the money that was spent on it.
99. The learning center is not the best source of primary information.
100. The learning center is an aid to private study.
101. I do not use the learning center very often.
102. The learning center is a waste of time.
103. The learning center is primarily a backup to other ways of studying.
104. The learning center is a waste of money.

APPENDIX II. 31 ITEM TRYOUT FORM

1.	The learning center is extremely helpful.	A	D
2.	It is good on ground operations.	A	D
3.	The learning center is not useful.	A	D
4.	The learning center is good-everything is good.	A	D
5.	The explanations are good in learning center programs.	A	D
6.	There is not enough room in the learning center.	A	D
7.	The learning center is not cool enough.	A	D
8.	There is too much noise at the learning center.	A	D
9.	The center is too crowded.	A	D
10.	Cokes should be allowed in the center.	A	D
11.	The center is not worthwhile.	A	D
12.	The learning center is excellent.	A	D
13.	The learning center points out my weak areas.	A	D
14.	The learning center is a waste of time.	A	D
15.	The learning center is a waste of money.	A	D
16.	The learning center is worthwhile.	A	D

1.	Monotone voice on tape puts you to sleep.	A	D
2.	There is a good atmosphere in the learning center.	A	D
3.	You can go to sleep in the learning center.	A	D
4.	The learning center gives a good visual experience.	A	D
5.	The material teaches too fast.	A	D
6.	There is no feel for what is being done.	A	D
7.	Times should be scheduled better for learning center use.	A	D
8.	The early part of the material is good.	A	D
9.	The center points out specific needs.	A	D
10.	The learning center makes for good use of time.	A	D
11.	The learning center has good supplemental material.	A	D
12.	The center could be arranged better.	A	D
13.	The learning center is good for instruments.	A	D
14.	I use the learning center quite often.	A	D
15.	The learning center aids in understanding.	A	D

APPENDIX III. FINAL FORM OF 16 ITEM ATTITUDE SCALE

INSTRUCTIONS

The statements on the following page refer to the T-37 and T-38 learning centers at Williams AFB.

Please circle (A) for Agree or (D) for Disagree to reflect your own attitude toward the learning centers. Indicate an answer to all statements because you do not have to strongly agree or disagree to warrant choosing (A) or (D). A slight favoring of one choice over another is sufficient.

Turn this survey in to the person who passed it out when you finish. Thank you for your cooperation in this Human Resources Laboratory project.

Name (Optional)	Rank & SSAN	Class or Squadron	Date

Your overall attitude toward the learning center:

Like Very Much ☐ Like ☐ Neutral ☐ Dislike ☐ Dislike Very Much ☐

Comments.

1.	The learning center is a waste of money.	A	D
2.	There is a good atmosphere in the learning center.	A	D
3.	It is good on ground operations.	A	D
4.	The material teaches too fast.	A	D
5.	The learning center is a waste of time.	A	D
6.	The explanations are good in the learning center.	A	D
7.	The early part of the material is good.	A	D
8.	The center is not worthwhile.	A	D
9.	Cokes should be allowed in the center.	A	D
10.	The learning center points out my weak areas.	A	D
11.	There is too much noise at the learning center.	A	D
12.	The learning center makes for good use of time.	A	D
13.	The learning center is extremely helpful	A	D
14.	The learning center is excellent.	A	D
15.	The learning center is not cool enough.	A	D
16.	The learning center is not useful.	A	D

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13. ABSTRACT

This project was an initial study to ascertain the impact, effectiveness, and acceptance of learning centers within Undergraduate Pilot Training (UPT). Using an in-house developed scale, characterized by equal-appearing intervals as first proposed by Thurstone and Chave, measurement of student toward UPT learning centers was made. Administration of the scale to 297 UPT students produced very strong evidence of positive, favorable attitude toward the learning center concept. Comments, obtained during student interviews and final form administration, may be beneficial to learning center managers and operators.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
learning center attitude measurement Undergraduate Pilot Training training innovations attitude scale construction						